

Psychometric Properties of the Chinese Version of the Swanson, Nolan, and Pelham, Version IV Scale-Teacher Form

Susan Shur-Fen Gau,^{1,2} MD, PhD, Chien-Ho Lin,³ MD, Fu-Chang Hu,⁴ PhD, Chi-Yung Shang,^{1,2} MD, James M. Swanson,⁵ PhD, Yu-Chih Liu,⁶ MD, and Shih-Kai Liu,⁷ MD

¹Department of Psychiatry, National Taiwan University Hospital, ²Department of Psychiatry, College of Medicine, National Taiwan University, ³Department of Psychiatry, Chimei Medical Center, ⁴National Center of Excellence for General Clinical Trial and Research, National Taiwan University Hospital and College of Public Health, National Taiwan University, ⁵University of California at Irvine, Child Development Center, ⁶Department of Psychiatry, Buddhist Dalin Tzu Chi General Hospital, and ⁷Department of Child and Adolescent Psychiatry, Department of Health, Taoyuan Mental Hospital

Objectives To examine the psychometric properties of the Chinese version of Swanson, Nolan and Pelham IV Scale (SNAP-IV)-Teacher Form. **Methods** The sample included a representative sample of 3,653 first to eighth graders (boys, 52.3%) and 190 children diagnosed with ADHD (aged 6–15). Teachers completed the Chinese versions of the SNAP-IV, and Strengths and Difficulties Questionnaire. **Results** The confirmatory factor analysis revealed a four-factor structure (inattention, hyperactivity, impulsivity, and opposition) with an adequate fit (Comparative Fit Index = 0.990; root mean square error of approximation = 0.058). The test–retest reliability (intraclass correlations = 0.60–0.84), internal consistency (α = .88–.95), and concurrent validity (Pearson correlations = 0.61–0.84) were satisfactory. Children with both ADHD and oppositional defiant/conduct disorders had the highest scores, followed by children with ADHD only who had intermediate scores and then school-based participants who had the lowest scores. **Conclusions** Our findings suggest that the Chinese SNAP-IV-Teacher Form is a reliable and valid instrument for rating ADHD and oppositional symptoms (ClinicalTrials.gov number, NCT00491361).

Key words Chinese version; reliability; SNAP-IV; teacher; validity.

Introduction

Attention-deficit/hyperactivity disorder (ADHD), characterized by inattention, hyperactivity, and impulsivity [American Psychiatric Association (APA), 1994], is the most prevalent childhood neuropsychiatric disorder (Fantuzzo et al., 2001), affecting 5.29% of school-age children worldwide (Polanczyk, de Lima, Horta, Biderman, & Rohde, 2007), 7.5% in Taiwan (Gau, Chong, Chen, & Cheng, 2005) and 7.8% in the USA [Centers for Disease Control and Prevention (CDC), 2005]. Rating scales have been valuable tools for measuring ADHD symptoms (Zolotor, Mayer, & Hill, 2004). In addition to parent's reports (Jensen et al., 1999), teacher's reports on child behaviors have been recognized as an important

component of measurement of ADHD symptoms (Tripp et al., 2006). Moreover, the *Diagnostic and Statistical Manual of Mental Disorders, 4th edition* (DSM-IV, APA, 1994) requirements of impairments in more than one setting have made teacher reports essential in making the ADHD diagnosis (Nolan, Gadow, & Sprafkin, 2001; Tripp et al., 2006).

Among the various teacher rating scales for ADHD symptoms, we developed a Chinese version of the Swanson, Nolan, and Pelham Rating Scale-IV (SNAP-IV) (Swanson, 1992; Swanson et al., 2001; Swanson, Sandman, Deutsch, & Baren, 1983) because it is psychometrically valid and mirrors DSM IV. The SNAP-IV-Teacher Form differs from other teacher behavioral rating scales

All correspondence concerning this article should be addressed to Susan Shur-Fen Gau, Department of Psychiatry, National Taiwan University Hospital No. 7, Chung-Shan South Road, Taipei, Taiwan 10002.
E-mail: gaushufe@ntu.edu.tw

Journal of Pediatric Psychology 34(8) pp. 850–861, 2009
doi:10.1093/jpepsy/jsn133

Advance Access publication December 12, 2008

Journal of Pediatric Psychology vol. 34 no. 8 © The Author 2008. Published by Oxford University Press on behalf of the Society of Pediatric Psychology. All rights reserved. For permissions, please e-mail: journals.permissions@oxfordjournals.org

available in Taiwan such as the Teacher Report Forms (Achenbach, 1991; Gau et al., 2005), and Conners' Teacher Rating Scale-Revised: Short Form (CTRS-R:S) (Conners, Sitarenios, Parker, & Epstein, 1998b; Gau, Soong, Chiu, & Tsai, 2006), because the SNAP-IV directly employs the DSM-IV symptom criteria of ADHD and oppositional defiant disorder (ODD) (APA, 1994) and both parents and teachers report on identical versions of the SNAP-IV. Although both the SNAP-IV (26 items) and the CTRS-R:S (28 items) contain items reflecting the DSM-IV symptoms of ADHD (18 items) and ODD (8 items) and both use a 4-point rating, the summary scores of the two instruments differ. The CTRS-R: S consists of three factor-derived subscales [Oppositional (five items), Inattention/Cognitive Problems (five items), and Hyperactivity/Impulsivity (seven items)], while the SNAP-IV includes all of the items in the DSM-IV symptom criteria. Hence, the SNAP-IV parallels the other procedures that clinicians typically employ in clinical practice, such as diagnostic interviews based on the DSM-IV criteria (Collett, Ohan, & Myers, 2003).

Since first introduced in 1980, the SNAP, has been revised several times to incorporate changes in diagnostic criteria of the DSM III, DSM III-R, and DSM-IV, and widely used in a variety of settings as an instrument for evaluating the efficacy of ADHD treatment and symptom improvement over time (Gaub & Carlson, 1997; Swanson, 1992). The original SNAP-IV included items from the series of DSM definitions (43 items). It was later shortened to include the 26 DSM-IV items for use in the assessment batteries of the NIMH Collaborative Multisite Multimodal Treatment Study for ADHD (MTA) (The MTA Cooperative Group, 1999). This revised version consists of the DSM-IV symptoms for inattention (items 1–9), hyperactivity (items 10–15), and impulsivity (items 16–18) of the criteria for ADHD, and the oppositional (OP) symptoms (items 19–26) of the criteria for ODD. The symptom severity of each symptom item is rated on a four-point rating scale (0 = “not at all”, 1 = “just a little”, 2 = “quite a bit”, and 3 = “very much”). Among the many assessment batteries in the MTA study, the three subscales of the SNAP-IV from two sources (parents and teachers) proved to be the most sensitive for documenting significant treatment group differences in the primary analyses (The MTA Cooperative Group, 1999).

In addition to the MTA study (Swanson et al., 2001), the teacher report form of the SNAP-IV has been used in several clinical trials to assess the efficacy of treatment for ADHD (Keating & Figgitt, 2002; Pelham et al., 2001; Wigal et al., 2004), in several clinical and epidemiology

studies (Atkins, Pelham, & Licht, 1985; King & Young, 1982; Newcorn et al., 2001) and one pharmacogenetics study (McGough et al., 2006) to measure ADHD symptom severity in Western populations. However, despite its frequent use in research, the psychometric properties of the teacher-rated SNAP-IV have not yet been adequately evaluated and need to be examined thoroughly.

Due to the use of the teacher-rated SNAP primarily in samples from Western populations, it is vitally important to evaluate its latest version (SNAP-IV) and its relative study results among different ethnic groups (Hoza et al., 2000). Although our recent study demonstrated that the Chinese SNAP-IV-Parent Form has satisfactory reliability and validity consistent with estimates derived from Western samples (Gau, Shang, et al., 2008), and has been used in a national survey of adherence to methylphenidate among children with ADHD (Gau, Chen, et al., 2008), there is lack of information about the psychometric properties of the Chinese SNAP-IV-Teacher Form. Hence, this study examined the psychometric properties of the Chinese SNAP-IV-Teacher Form. We aimed to perform confirmatory factor analysis (CFA), and examine the reliability, and concurrent validity of the Chinese SNAP-IV-Teacher Form in a representative sample in Taiwan. This study also examined the discriminative validity of the Chinese SNAP-IV-Teacher Form by comparing children with and without ADHD.

Methods

Community Sample

A total of 3,899 first to eighth graders were recruited from northern Taiwan (Taipei City and Taoyuan County) and southern Taiwan (Tainan City and Chiayi County). In April 2005, we randomly selected one or two primary and junior high schools according to the school sizes among the schools where school principals agreed to participate in this study. Two to three classes from each grade level (grades 1–8) were randomly selected according to the estimated 100–120 students at each school grade level in each study site. In total, 116 classes and 3,653 participants (1,909 boys, 52.3% and 1,744 girls, 47.7%) were included in the final sample. The parents and teachers of these students gave informed consent to participate in this study. About half of fathers and mothers were senior high graduates (50.9%, 57.6%) and one-fourth were college graduates or above (28.9%, 21.0%), respectively. In the four locations (Taipei, Taoyuan, Chiayi, and Tainan city), there were 35, 25, 24, 32 classes and 1,068 (29.2%), 835 (22.9%), 830 (22.7%), 920 (25.2%) students, respectively. The average participation rate was

94% with 99%, 99%, 97%, and 83% of the total 1,078, 849, 858, and 1,114 eligible students in these locations, respectively.

Clinic-Based Sample

We recruited children with DSM-IV ADHD consecutively from the Children's Mental Health Center, National Taiwan University Hospital, between June 2005 and September 2005. This clinic-based sample consisted of 190 children aged 6–15 (164 boys, 86.3%). All of them were diagnosed with ADHD and were not co-morbid with pervasive developmental disorder and/or mental retardation or other psychiatric disorders with the exception of ODD (38, 20%), conduct disorder (CD) (20, 10.5%), and tic disorders (9, 4.7%). Of the children with ADHD, 128 (67.4%), 51 (26.8%), and 11 (5.8%) were diagnosed with combined type, predominantly inattentive type, and predominantly hyperactive-impulsive type, respectively. The average length (*SD*) of observation by the teachers was 1.30 years (0.61).

The DSM-IV diagnosis of ADHD and other psychiatric disorders were made based on the clinical diagnoses by the first author (Gau) and also confirmed by the psychiatric interviews using the Chinese version of the Kiddie-Schedule for Affective Disorders and Schizophrenia-Epidemiology version (K-SADS-E) (Gau & Soong, 1999; Gau et al., 2005) before or during the study period (Gau, Shen, Soong, & Gau, 2006; Gau et al., 2007; Chiang & Gau, 2008). The Chinese K-SADS-E, a reliable and valid instrument, has been used extensively in a variety of studies regarding childhood and adolescent mental disorders in Taiwan (Gau et al., 2005).

Measures

The questionnaire consisted of the Chinese SNAP-IV-Teacher Form and Strengths and Difficulties Questionnaires-Teacher Form. Demographic information was provided by both parents and teachers.

Strengths and Difficulties Questionnaires (SDQ)

The SDQ, a 25-item behavioral screening questionnaire, is designed to assess a broad range of different behavioral aspects of children and adolescents (Goodman, 1999). Each item is rated on a 3-point Likert scale (Not true, somewhat true, and certainly true). The psychometric study of the Chinese version of SDQ-Teacher Form was conducted by Gau with the permission of Goodman, in which four subscales were identified by exploratory factor analysis: prosocial, externalizing, internalizing, and inattention subscales. The externalizing, inattention, and internalizing subscales were used to validate

the Chinese SNAP-IV-Teacher Form for this study. The three subscales of the Chinese SDQ have demonstrated good test-retest reliability (intra-class correlations, ICC = 0.80–0.81) and moderate internal consistency (Cronbach's $\alpha = .82-.84$).

Procedures

The Chinese SNAP-IV was prepared with culture-relevant colloquial expressions and two-way translation by Gau and colleagues after permission was granted by Swanson to ascertain the linguistic and content validity of this scale (Gau, Shang, et al., 2008). The Research Ethics Committee of the NTUH approved this study prior to multistage sampling in May 2005. In June 2005, written informed consent was obtained from the parents of both community subjects and clinic-based subjects after an explanation of the purpose and procedure of the study along with the reassurance of confidentiality. In addition to parental reports on the Chinese SNAP-IV, which has been published (Gau, Shang, et al., 2008), teachers completed the Chinese SNAP-IV and SDQ at schools. Of the 3,653 participants, teachers of 233 subjects, who were selected using a systemized fix interval sample method, completed the questionnaire 2 weeks later for the test-retest reliability study (participation rate = 100%). Parents of clinical subjects brought the questionnaire and a research letter to the teachers, and the teachers then completed the questionnaire at school and returned it in a sealed envelope.

Statistical Analysis

Data analyses were performed using the SAS 9.1.3 (SAS Institute Inc., Cary, NC, USA) and LISREL 8.54 (SSI Inc., Chicago, IL, USA) software. The full sample was split into two subsamples to cross-validate the findings regarding the factor structures of the Chinese SNAP-IV. We first conducted EFA using a principal factor estimation method and oblique promax rotation in the 1,903 subjects from Taipei and Taoyuan. Subsequently, we took the final three-factor and four-factor models from EFA as the initial factor models for CFA to confirm the factor structure using the covariance matrix of the ratings of all 26 items of the Chinese SNAP-IV in the other 1,750 subjects from Chiayi and Tainan. To assure the quality of analysis results, basic model-fitting techniques were applied in CFA. First, with the aid of knowledge and insight, stepwise variable selection was performed by iterating the following two actions: (i) using the Wald's *t*-test to drop insignificant structural parameter and (ii) using the Modification Index (MI) to add additional meaningful structural parameter.

Next, since chi-squared goodness-of-fit test may detect small and trivial differences in the settings of large sample size, the Goodness-of-Fit Index (GFI), Adjusted GFI, root mean square error of approximation (RMSEA), and Comparative Fit Index (CFI) were particularly examined. The usual cut-off values for well-fitted factor models are >0.90 for GFI and adjusted GFI, <0.06 for RMSEA, and >0.90 for CFI (Muthen & Muthen, 1998). Finally, model diagnosis was conducted by examining the estimated factor loadings, the estimated correlations between latent variables and between measurement errors, and the standardized residual variance-covariance matrix to detect model problem and identify poorly fitted relationships.

Intra-class correlations (ICC) were calculated for the test-retest reliability, and Cronbach's α was calculated for the internal consistency of four subscales of the Chinese SNAP-IV based on the CFA. Paired *t*-test was used to test for mean differences in the repeated SNAP-IV measures. Inter-correlations among the four subscales were computed. Concurrent validity was tested by the Pearson correlations (γ_p) between the subscales of the Chinese SNAP-IV and SDQ.

To examine the gender and age differences on the SNAP-IV symptom scores, a linear mixed model with both fixed and random effects was used to address subjects nested within the same class and school for the multi-stage sampling of the school-based sample was used (Singer, 1998). The linear trend for eight school grade levels was tested for each subscale after departure from the linear trend was rejected based on the Bayesian information criterion (i.e., Schwarz's Bayesian criterion). We compared the model that treated school grade level as a categorical variable with the model that treated the eight school grade levels as a dimensional variable.

To evaluate discriminative validity, analysis of covariance with age and sex as covariates was used to compare the mean scores and the *T*-scores of the subscales of the SNAP-IV between the 190 clinical subjects with ADHD and 407 school participants randomly selected from the community sample to match the sex and age composition of the ADHD group. The item mean score of each subscale in the community sample stratified by age and sex was used to calculate the *T*-score for clinical subjects. We also compared the *T*-scores of the three scales of the SNAP-IV among ADHD children with ODD/CD, children with ADHD only, and school controls. The post-hoc analysis used the Bonferroni method to adjust *p* values for the comparisons among the three groups. Cohen's *d* was used to compute the effect size (standardized difference between the two means) among the three groups (Cohen, 1988).

Results

Confirmatory Factor Analysis

We used the three-factor (inattention, hyperactivity/impulsivity, oppositional) and four-factor (inattention, hyperactivity, impulsivity, oppositional) structure models obtained from EFA as the initial models to perform CFA to choose a final model with adequate fit. We employed the basic model-fitting techniques for CFA and found the three-factor model did not have an adequate fit (GFI = 0.770, AGFI = 0.727, CFI = 0.869, RMSEA = 0.104, Table I) but the four-factor model showed an adequate fit (GFI = 0.922, AGFI = 0.901, CFI = 0.990, RMSEA = 0.058, Table I and Figure 1). Therefore, the four-factor model was the final model for the Chinese SNAP-IV-Teacher Form (Factor 1: items 19–26 for oppositional; Factor 2: items 1–10 for inattention; Factor 3: items 10–14, 17, 21, and 22 for hyperactivity; and Factor 4: items 8, 15–18, and 20 for impulsivity).

We then examined the factor loading of each item to the four latent variables based on the result of CFA. Since the correlations between the four factors were quite high, we further modified the four-factor model to include a secondary factor in CFA (Figure 1). We also examined whether the factor structure would be different between boys and girls. The values of the above-mentioned goodness-of-fit indexes were similar between (i) the four-factor model fitted to boys only, (ii) the four-factor model fitted to girls only, and (iii) the two-sample four-factor model fitted to boys and girls. Thus, we decided to accept the final four-factor model for boys and girls together as shown in Table II and Figure 1.

Test-Retest Reliability and Internal Consistency

Table III shows that the Chinese SNAP-IV demonstrated good test-retest reliability (ICC = 0.60–0.84) and high internal consistency (all Cronbach's $\alpha \geq .88$) for four subscales based on CFA. Although there was significant difference between the two measurements in the hyperactivity, impulsivity, and oppositional subscales, all the 95% CI for the difference included zero suggesting no difference between the two measurements.

Table I. Fit Indices for the three-factor and four-factor Models of the Chinese SNAP-IV-Teacher Form Based on Confirmatory Factor Analysis Using Tainan and Chiayi Samples

Model	GFI	AGFI	CFI	RMSEA
Three-factor	0.770	0.727	0.869	0.104
Four-factor	0.922	0.901	0.990	0.059

GFI: Goodness of Fit Index; AGFI: Adjusted Goodness of Fit Index; CFI: Comparative Fit Index; RMSEA: root mean square error of approximation.

Concurrent Validity

The concurrent validity of the SNAP-IV was tested via correlations with the Chinese SDQ. The inattention scores of the SNAP-IV was highly correlated with the inattention ($\gamma_p = 0.74$) and externalizing ($\gamma_p = 0.64$) subscales; and moderately correlated with the internalizing ($\gamma_p = 0.36$) subscale of the SDQ. The hyperactivity, impulsivity, and oppositional scores were highly correlated with the externalizing ($\gamma_p = 0.79, 0.77, \text{ and } 0.80$, respectively), moderately correlated with the inattention subscale ($\gamma_p = 0.50, 0.54, \text{ and } 0.42$, respectively), and correlated lower with the internalizing subscale ($\gamma_p = 0.20, 0.16, \text{ and } 0.19$, respectively) of the SDQ. We further tested the size of the differences between the correlations corresponding and noncorresponding SNAP-IV-Teacher Form and SDQ subscales. All of the differences were statistically significant (all p values $< .05$) except that there was no difference between hyperactivity-internalizing

($\gamma_p = 0.20$) and oppositional-internalizing ($\gamma_p = 0.19, p = .660$), hyperactivity-externalizing ($\gamma_p = 0.79$) and oppositional-externalizing ($\gamma_p = 0.80, p = .254$), impulsivity-internalizing ($\gamma_p = 0.16$) and oppositional-internalizing ($\gamma_p = 0.19, p = .207$), hyperactivity-internalizing ($\gamma_p = 0.20$) and impulsivity-internalizing ($\gamma_p = 0.16, p = .087$). In summary, the inattention, hyperactivity, impulsivity, and oppositional subscales of the Chinese SNAP-IV were highly correlated with their corresponding subscales on the SDQ.

Age and Gender Differences

Table IV presents the mean score and SD's for the four subscales of the SNAP-IV by gender and school grade levels. Boys scored significantly higher on the four subscales across eight grades. School grade level can be treated as a linear variable for the hyperactivity, and oppositional subscales (girls only) because the departure from the linear

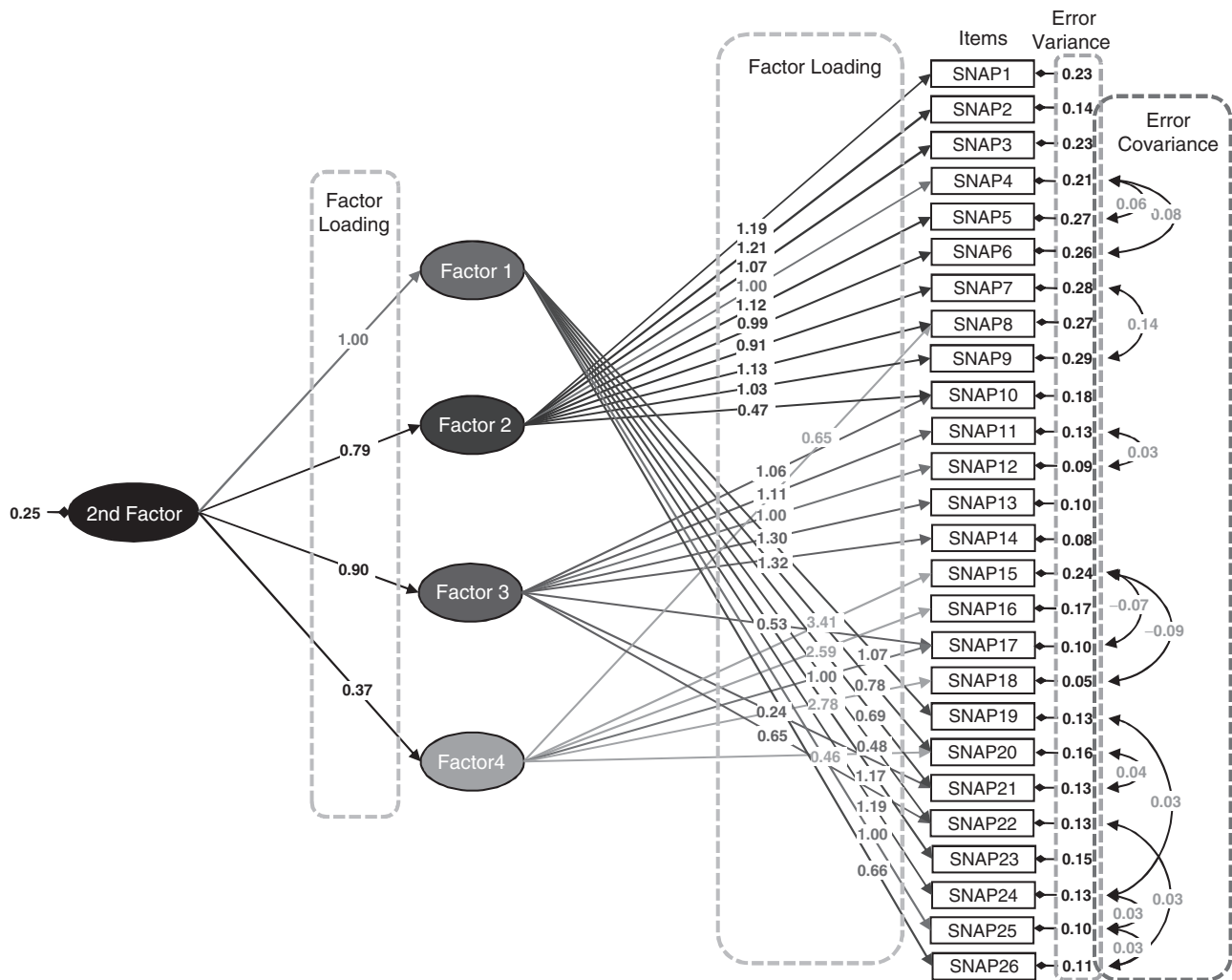


Figure 1. Four-factor structure of the Chinese SNAP-IV-Teacher Form by using the Confirmatory Factor Analysis.

trend of the school grade levels was rejected. The hyperactivity symptom ratings declined with age for boys and the full sample. The oppositional symptoms ratings increased with age for girls beginning in grade 2. There were no significant differences for inattention and impulsivity

Table II. Factor Loading of Each Item of the Chinese SNAP-IV-Teacher Form Based on Confirmatory Factor Analysis Using Tainan and Chiayi Samples

Items	Factor loading (n = 1750)			
	Factor 1	Factor 2	Factor 3	Factor 4
Makes careless mistakes	–	1.188	–	–
Cannot pay attention	–	1.212	–	–
Doesn't listen	–	1.074	–	–
Fails to finish work	–	1.000	–	–
Disorganized	–	1.021	–	–
Cannot concentrate	–	0.985	–	–
Loses things	–	0.909	–	–
Distractible	–	1.129	–	0.691
Forgetful	–	1.027	–	–
Fidgets/squirms	–	0.466	1.056	–
Leaves seat	–	–	1.114	–
Runs about or restless	–	–	1.000	–
Cannot playing quietly	–	–	1.301	–
Driven/on the go	–	–	1.320	–
Talks excessively	–	–	–	3.405
Blurts out answers	–	–	–	2.589
Difficulty awaiting turn	–	–	0.526	1.000
Intrudes on others	–	–	–	2.777
Loses temper	1.073	–	–	–
Argues with adults	0.779	–	–	0.464
Actively defines	0.685	–	0.239	–
Does things deliberately	0.481	–	0.651	–
Blames others for his or her mistakes	1.174	–	–	–
Easily annoyed by others	1.190	–	–	–
Angry and resentful	1.000	–	–	–
Spiteful or vindictive	0.660	–	–	–

Chi-square = 20+1.001 (p = .0), degrees of freedom = 277; Goodness of Fit Index (GFI) = 0.922; Adjusted Goodness of Fit Index (AGFI) = 0.901; root mean square error of approximation (RMSEA) = 0.058 (90% CI, 0.056–0.061); Comparative Fit Index (CFI) = 0.990.

scores across the eight school grade levels. There were significant interactions between gender and school grade levels on the hyperactivity [$F_{(13,197)} = 12.64, p < .001$], impulsivity [$F_{(13,197)} = 6.88, p = .009$], and oppositional symptoms [$F_{(13,197)} = 12.19, p < .001$]. The decreased hyperactivity severity with age was more obvious in boys than in girls; whereas, the changes of the oppositional symptoms across age were only significant for girls.

Discriminative Validity

Table V lists the mean T-scores and SD of the subscales of the SNAP-IV among three groups: ADHD with ODD/CD, ADHD only, and school controls. There were statistically significant differences across the four subscale scores among the three groups, showing that the ADHD with ODD/CD group had the highest scores, followed by the ADHD only group, then the controls. The effect sizes of these differences, defined by Cohen's d (Cohen, 1988), were large (>0.82) except for the comparisons of inattention (d = 0.58) and hyperactivity (d = 0.78) between the ADHD with ODD/CD and ADHD only groups, which had medium effect sizes.

Although ADHD children with medication or without medication scored higher in the four symptom dimensions, there were no differences between ADHD children with and without medication except that nonmedicated ADHD children had more severe inattention than medicated ADHD children (Table VI).

Discussion

In Taiwan, the increased public awareness of ADHD and rates of ADHD that were similar to those in Western countries have highlighted the need for an instrument to measure ADHD symptoms in Chinese with methods similar to Western countries. To fulfill this need, we conducted a comprehensive evaluation of the psychometric properties of the Chinese SNAP-IV-Teacher Form in both community

Table III. Test-Retest Reliability and Internal Consistency of the Chinese SNAP-IV Teacher Form

Subscales	Test-retest reliability						Internal consistency Cronbach's α
	ICC	Time 1 Mean ^a ± SD	Time 2 Mean ^a ± SD	Difference Mean (95% CI)	T-value	p	
				(n = 233)			(n = 3653)
Inattention	0.84	0.78 ± 0.71	0.78 ± 0.77	0.00(–0.83 to 0.83)	0.03	0.868	.95
Hyperactivity	0.68	0.23 ± 0.41	0.32 ± 0.49	0.09(–0.62 to 0.79)	14.45	<0.001	.94
Impulsivity	0.71	0.47 ± 0.49	0.53 ± 0.56	0.07(–0.71 to 0.85)	6.61	0.011	.88
Oppositional	0.60	0.24 ± 0.45	0.32 ± 0.46	0.08(–0.71 to 0.87)	8.49	0.004	.95

SNAP-IV: Chinese version of the Swanson, Nolan, and Pelham, version IV; ICC: intraclass correlation.

^aItem means.

and clinic-based samples. Our findings suggested that although the Chinese SNAP-IV-Teacher Form showed slightly different factor structure from the English version and from the Chinese parent form, our results demonstrated the satisfactory reliability and validity of this scale. In addition to distinguishing ADHD clinic children from school-based children, the teacher-rated SNAP-IV also demonstrated the ability to discriminate ADHD children with ODD/CD from children with ADHD only. However, only inattention subscale can distinguish ADHD children without medication from ADHD children with medication.

According to our CFA findings, the Chinese SNAP-IV-Teacher Form showed four factor structure: inattention (items 1–10), hyperactivity (items 10–14, 17, 21, and 22), impulsivity (items 8, 15–18, and 20), and oppositional (items 19–26). Similar to previous studies (Molina, Smith, & Pelham, 2001), the factor structure identified by using CFA is reasonable and acceptable under the DSM-IV model of ADHD and ODD. Item 10 “fidgets or squirms,” a behavioral item in the hyperactivity subscale was also loaded in the inattention subscale, suggesting that fidgets/squirms tend to occur with inattention symptoms. Item 17 “difficulty waiting for turns or in line,” an item in the impulsivity subscale; and item 21 “actively defines”

and item 22 “annoy others,” two items in the oppositional subscale were also included in the hyperactivity subscale. Item 8 “distractibility,” an item in the inattention subscale and item 20 “arguing,” an item in the oppositional subscale, were included in the impulsivity subscale. Furthermore, the high correlation between four factors suggested that there was a common factor behind these factors (Figure 1). It can be explained by the high correlations among the three core symptoms of ADHD and high co-occurrence of ADHD and oppositional symptoms or high comorbidity between ADHD and ODD (Johnston & Jassy, 2007). In summary, the Chinese SNAP-IV-Teacher Form achieved adequate model fit for the four factor model with separate subscales for hyperactivity and impulsivity, suggesting that the model reflects the underlying characteristics of children with ADHD, instead of culturally distinct perceptions of teachers (Wolraich et al., 2003).

Like previous findings with the Chinese parent-rated SNAP-IV (Gau, Shang, et al., 2008), the four subscales of the Chinese teacher-rated SNAP-IV in this study were stable over time and had very high internal consistencies, suggesting that the Chinese instrument may be more stable than the English version (Correia Filho et al., 2005). The high stability suggests that large changes in

Table IV. SNAP-IV Teacher Form by Grade Groups and Gender in a Nonreferred Child Samples

Mean (SD) ^a	Grade 1 (n = 390)	Grade 2 (n = 436)	Grade 3 (n = 427)	Grade 4 (n = 388)	Grade 5 (n = 467)	Grade 6 (n = 461)	Grade 7 (n = 554)	Grade 8 (n = 530)
Inattention								
Male	0.99 (0.82)	0.73 (0.61)	1.00 (0.73)	0.86 (0.76)	0.87 (0.76)	0.82 (0.78)	0.90 (0.78)	0.91 (0.76)
Female	0.51 (0.62)	0.40 (0.49)	0.53 (0.53)	0.42 (0.57)	0.44 (0.54)	0.44 (0.56)	0.41 (0.47)	0.48 (0.48)
Total	0.76 (0.77)***	0.57 (0.58)***	0.77 (0.68)***	0.64 (0.71)***	0.66 (0.70)***	0.63 (0.71)***	0.68 (0.71)***	0.71 (0.68)***
Hyperactivity ^b								
Male ^c	0.67 (0.79)	0.45 (0.57)	0.67 (0.72)	0.46 (0.68)	0.48 (0.67)	0.38 (0.55)	0.48 (0.71)	0.37 (0.61)
Female	0.19 (0.42)	0.11 (0.25)	0.12 (0.24)	0.09 (0.30)	0.06 (0.19)	0.14 (0.35)	0.11 (0.27)	0.12 (0.25)
Total ^d	0.44 (0.68)***	0.29 (0.46)***	0.40 (0.61)***	0.28 (0.56)***	0.27 (0.53)***	0.26 (0.48)***	0.31 (0.59)***	0.25 (0.49)***
Impulsivity ^e								
Male	0.84 (0.76)	0.64 (0.57)	0.80 (0.69)	0.74 (0.69)	0.76 (0.73)	0.64 (0.63)	0.68 (0.70)	0.64 (0.66)
Female	0.36 (0.51)	0.29 (0.35)	0.33 (0.40)	0.28 (0.44)	0.25 (0.35)	0.31 (0.47)	0.30 (0.41)	0.38 (0.46)
Total	0.61 (0.70)***	0.47 (0.51)***	0.587 (0.61)***	0.52 (0.62)***	0.51 (0.63)***	0.48 (0.58)***	0.51 (0.62)***	0.52 (0.59)***
Oppositional ^f								
Male	0.54 (0.67)	0.45 (0.53)	0.59 (0.69)	0.53 (0.74)	0.52 (0.72)	0.49 (0.66)	0.45 (0.71)	0.41 (0.63)
Female ^g	0.23 (0.46)	0.14 (0.29)	0.15 (0.32)	0.15 (0.39)	0.13 (0.36)	0.19 (0.41)	0.25 (0.48)	0.27 (0.49)
Total	0.39 (0.60)***	0.29 (0.46)***	0.38 (0.58)***	0.34 (0.62)***	0.33 (0.60)***	0.34 (0.57)***	0.36 (0.63)**	0.35 (0.57)*

SNAP-IV: Chinese version of the Swanson, Nolan, and Pelham, version IV.

^aItem means.

^bInteraction between age and sex, $F_{(13,197)} = 12.64$, $p < .001$.

^cLinear trend of grade for boys only: $\beta = -0.0344$, $F_{(11,621)} = 5.75$, $p = .017$.

^dLinear trend of age for the full sample: $\beta = -0.019$, $F_{(13,199)} = 4.22$, $p = .040$.

^eInteraction between age and sex, $F_{(13,197)} = 8.58$, $p = .003$.

^fInteraction between age and sex, $F_{(13,197)} = 12.19$, $p < 0.001$.

^gLinear trend of grade for girls only: $\beta = 0.016$, $F_{(11,480)} = 4.82$, $p = 0.028$.

* $p < .01$, ** $p < .001$, *** $p < .0001$ for gender difference.

Table V. *T*-scores of SNAP-IV Teacher Form by ADHD Children with ODD/CD, ADHD Children Without ODD/CD, and Normal Controls

	<i>T</i> -score, Mean (<i>SD</i>)					Cohen <i>d</i>			
	ADHD			Controls (<i>n</i> = 407)	Comparisons <i>F</i> -value*	All ADHD/ control	ADHD +ODD(CD)/ control	ADHD only/control	ADHD +ODD(CD)/ ADHD only
	Total (<i>n</i> = 190)	ADHD+ ODD/CD (<i>n</i> = 51)	ADHD only (<i>n</i> = 139)						
Inattention	66.6 (9.4)	70.1 (8.1)	65.0 (9.4)	51.6 (11.3)	133.57	1.44	1.88	1.29	0.58
Hyperactivity	67.5 (12.3)	74.4 (12.9)	65.0 (11.0)	52.8 (11.7)	116.44	1.22	1.75	1.07	0.78
Impulsivity	69.0 (12.3)	75.7 (10.9)	66.6 (11.2)	52.6 (11.1)	153.48	1.40	2.10	1.26	0.82
Oppositional	67.7 (13.1)	79.7 (12.2)	63.4 (10.5)	52.0 (10.9)	175.61	1.30	2.39	1.07	1.43

Attention-deficit/Hyperactivity Disorder; SNAP-IV: Chinese version of the Swanson, Nolan, and Pelham, version IV.

*Three groups comparisons, all $p < 0.001$, ADHD + ODD/CD > ADHD only > controls.

Table VI. *T*-scores of SNAP-IV Teacher Form by Medicated ADHD Children, Nonmedicated ADHD Children, and Normal Controls

	<i>T</i> -score, Mean (<i>SD</i>)				Cohen <i>d</i>		
	ADHD		Controls (<i>n</i> = 407)	Comparisons <i>F</i> -value*	Medicated/ control	Nonmedicated/ control	Medicated/ nonmedicated
	Medicated (<i>n</i> = 153)	Nonmedicated (<i>n</i> = 37)					
Inattention ^a	65.8 (9.6)	70.0 (8.0)	51.6 (11.3)	128.14	1.35	1.88	-0.48
Hyperactivity ^b	67.3 (12.6)	68.5 (11.0)	52.8 (11.7)	100.66	1.19	1.38	-0.10
Impulsivity ^b	69.2 (12.0)	68.0 (10.7)	52.6 (11.1)	136.44	1.44	1.41	0.11
Oppositional ^b	67.4 (13.1)	69.0 (13.2)	52.0 (10.9)	117.93	1.28	1.40	-0.12

Attention-deficit/Hyperactivity Disorder. SNAP-IV: Chinese version of the Swanson, Nolan, and Pelham, version IV.

^aAll $p < .001$.

^aThree groups comparisons: medicated ADHD, nonmedicated ADHD > controls ($p < .001$), nonmedicated ADHD > medicated ADHD ($p = .034$).

^bThree groups comparisons: medicated ADHD and nonmedicated ADHD significant higher than controls ($p < .001$); no significant difference between two ADHD groups (p values ranging from .450 to .589).

SNAP-IV-Teacher Form scores in clinical studies could safely be interpreted as due to intervention effects rather than to random inter-temporal fluctuations in scale scores.

These results support the findings of most previous studies of ADHD-related rating scales in Western countries (e.g., Fantuzzo et al., 2001; Nolan et al., 2001) and Taiwan (Gau, Shang, et al., 2008; Gau et al., 2006), but not all studies (e.g., Al-Awad & Sonuga-Barke, 2002; Mugnaini et al., 2006), showed that boys scored higher than girls in all subscales of teacher SNAP-IV. This cross-culturally valid finding (Crijnen, Achenbach, & Verhulst, 1999) indicates that the gender difference cannot be explained by bias from informants or instruments and suggests that we should consider a gender effect in diagnosing ADHD and probably ODD (Pelham, Gnagy, Greenslade, & Milich, 1992; Waschbusch & King, 2006).

Consistent with previous studies, our findings support a decline in hyperactivity with age among boys (e.g., Conners et al., 1998a; Gau et al., 2006, 2007) and no age difference in inattention and impulsivity subscale (e.g., Gau et al., 2006, 2007; Kumar & Steer, 2003). These findings imply that the degree of age-inappropriate inattention and impulsivity might not change but the

severity of hyperactivity symptoms might decrease from childhood to adolescence in the general population (Gau et al., 2006). A lack of longitudinal follow-up data limits our ability to test the hypothesis that inattention and impulsivity persists and hyperactivity decreases from childhood to adolescence (e.g., Biederman, Mick, & Faraone, 2000). In addition, like others (Costello, Mustillo, Erkanli, Keeler, & Angold, 2003; Faraone, Biederman, & Monuteaux, 2002), our findings also showed increased severity of oppositional symptoms with age among girls and fewer gender differences in the severity of oppositional symptoms with age. Moreover, the interactions between age and gender further suggest that age and gender norms should be established for using the SNAP-IV Teacher Form.

Similar to the findings of the Chinese SNAP-IV-Parent Form (Gau, Shang, et al., 2008), in which two well-known measures based on parent reports (CBCL and SDQ) were used to demonstrate that the SNAP-IV scale has adequate concurrent validity, the present study also showed that the SNAP-IV-Teacher Form is well-validated by concurrent teacher reports on the Chinese SDQ.

Our approach to examining the discriminative ability of the teacher-rated SNAP-IV was to compare the mean subscale scores between children with ADHD and school controls. The effect sizes for the comparisons of the four subscales between the ADHD and school controls appear to be large, implying that the oppositional subscale, along with the inattention, hyperactivity, and impulsivity subscales, clearly distinguished clinical subjects with ADHD from their counterparts. This is consistent with our previous studies using a different informant (Gau, Shang, et al., 2008b) or a different instrument (Gau et al., 2006) to assess ADHD-related symptoms. The unique finding of the oppositional subscale's ability to distinguish ADHD from non-ADHD can be explained by high comorbidity with ODD among children with ADHD resulting in increased correlations among the four subscales (Johnston & Jassy, 2007), or by the tendency of Taiwanese teachers to over-report oppositional symptoms among students with ADHD. Since the oppositional score was also significantly higher in the ADHD only group compared to controls, high comorbidity with ODD cannot completely explain these findings. Because teachers in Chinese culture expect their students to be submissive (Gau, 2007), they may interpret the typical behavioral symptoms related to ADHD as disobedience and consequently, may be more likely to give high ratings to these behaviors in such circumstances. Another interesting finding was the very large (2.39) and large (1.43) effect sizes in the comparisons between ADHD children with ODD/CD and controls, ADHD children with ODD/CD, and children with ADHD only, respectively. This set of findings strongly supports that the oppositional subscale has discriminative validity for ODD/CD.

Another approach to establish the discriminative validity of the SNAP-IV-Teacher Form is to compare the four symptom dimensions between children with ADHD currently treated and not treated with medication. However, only inattention subscale can distinguish ADHD children without medication from ADHD children with medication.

One major limitation of this study relates to the degree to which we can generalize these findings to the broader Taiwanese population. In addition, although there is a similar official language (Mandarin) and similarities in Chinese cultures, greatly influenced by Confucianism, there are also different writing characteristics (traditional Chinese in Taiwan, Hong Kong, and Singapore; simplified Chinese in China) and different degrees of westernization. Because of these differences across Chinese populations, further studies are needed before the Chinese SNAP-IV is assumed to be valid and reliable for all Chinese children.

Finally, without psychiatric diagnosis among community subjects, this study cannot identify the appropriate diagnostic cut-off points of the Chinese SNAP-IV-Teacher Form for diagnosis of ADHD. The hidden variance information other than the DSM-IV structure in the covariance matrices of the 26 items of the SNAP-IV-Teacher Form also deserves further exploration.

The strengths of this study include a large-scale non-referred sample with a wide age range of children from 6 to 15 years old, a satisfactory response rate, and our recruitment of both community and clinic-based samples. Also, this is the first study to conduct confirmatory factor analysis of the SNAP-IV-Teacher Form and use both clinical assessment and psychiatric interviews for ADHD diagnosis and other comorbid conditions in clinic-based subjects with ADHD. The study established that the Chinese SNAP-IV based on teacher rating scale is a reliable and valid standardized instrument for the assessments of school-aged children and has high concurrent validity.

The similar factor structures in the English version and the Chinese SNAP-IV-Parent Form, and the high internal consistency of the four subscales of the Chinese SNAP-IV-Teacher Form indicate that the symptom manifestation of ADHD and ODD in Taiwanese children is not overtly different from that of children in other countries and in other cultures. The results of the test-retest stability and validity of parent and teacher forms suggest that the Chinese SNAP-IV is a reliable and valid instrument to assess symptoms of ADHD and ODD, and to evaluate treatment effects in Taiwan.

The SNAP-IV-Teacher Form is especially suitable to measure ADHD symptoms in school settings because of its brevity, ease of administration, and representation of the DSM-IV criteria. In clinical settings, teacher reports are crucial for providing information on ADHD and ODD symptoms in classrooms and schools, and provide essential information to assist clinicians in making clinical diagnoses based on DSM-IV. Hence, the development of the Chinese SNAP-IV for teacher rating is an important step to improve assessment of ADHD in clinical practice and to promote the early identification of ADHD in schools and to assess the treatment and intervention effects in ADHD. However, it is important to note that no rating scale alone will provide sufficient evidence to reliably establish the diagnosis of ADHD and ODD. Clinical interviews, information from several sources (such as parent and teacher reports), and when possible, objective supporting evidence, are crucial in making a diagnosis of ADHD and ODD.

Acknowledgments

We would like to thank Ms Chi-Mei Lee and Ms Chia-Chi Cheng for their assistance in the LISREL statistical computing. Also, we would like to express our thanks to the subjects and their parents and teachers for their contribution.

Funding

This study was supported by grants from the National Health Research Institute (NHRI-EX94-9407PC, NHRI-EX95-9407PC), National Taiwan University Hospital (NTUH 95-301), Department of Health, Taiwan (DOH-95-HO-9518), and Buddhist Dalin Tzu Chi General Hospital (DTCRD 94(2)-02), Taiwan.

Conflict of interest: None declared.

Received December 25, 2007; revisions received November 20, 2008; accepted November 22, 2008

References

- Achenbach, T. M. (1991). *Manual for the Teacher's Report Form and 1991 profile*. Burlington: University of Vermont, Department of Psychiatry.
- Al-Awad, A. M., & Sonuga-Barke, E. J. (2002). The application of the Conners' Rating Scales to a Sudanese sample: an analysis of parents' and teachers' ratings of childhood behaviour problems. *Psychology and Psychotherapy*, *75*, 177–187.
- American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders: DSM-IV*. Washington, DC: American Psychiatric Association.
- Atkins, M. S., Pelham, W. E., & Licht, M. H. (1985). A comparison of objective classroom measures and teacher ratings of Attention Deficit Disorder. *Journal of Abnormal Child Psychology*, *13*, 155–167.
- Biederman, J., Mick, E., & Faraone, S. V. (2000). Age-dependent decline of symptoms of attention deficit hyperactivity disorder: impact of remission definition and symptom type. *The American Journal of Psychiatry*, *157*, 816–818.
- CDC. (2005). Mental health in the United States. Prevalence of diagnosis and medication treatment for attention-deficit/hyperactivity disorder-United States, 2003. *Morbidity and Mortality Weekly Report*, *54*, 842–847.
- Chiang, M. C., & Gau, S. S. (2008). Validation of attention deficit/hyperactivity disorder subtypes by neuropsychological functioning among Taiwanese children. *The Australian and New Zealand Journal of Psychiatry*, *42*, 525–534.
- Cohen, M. (1988). The Revised Conners Parent Rating Scale: Factor structure replication with a diversified clinical sample. *Journal of Abnormal Child Psychology*, *16*, 187–196.
- Collett, B. R., Ohan, J. L., & Myers, K. M. (2003). Ten-year review of rating scales. V: Scales assessing attention-deficit/hyperactivity disorder. *Journal of the American Academy of Child and Adolescent Psychiatry*, *42*, 1015–1037.
- Conners, C. K., Sitarenios, G., Parker, J. D., & Epstein, J. N. (1998a). The revised Conners' Parent Rating Scale (CPRS-R): Factor structure, reliability, and criterion validity. *Journal of Abnormal Child Psychology*, *26*, 257–268.
- Conners, C. K., Sitarenios, G., Parker, J. D., & Epstein, J. N. (1998b). Revision and restandardization of the Conners Teacher Rating Scale (CTRS-R): Factor structure, reliability, and criterion validity. *Journal of Abnormal Child Psychology*, *26*, 279–291.
- Correia Filho, A. G., Bodanese, R., Silva, T. L., Alvares, J. P., Aman, M., & Rohde, L. A. (2005). Comparison of risperidone and methylphenidate for reducing adhd symptoms in children and adolescents with moderate mental retardation. *Journal of the American Academy of Child & Adolescent Psychiatry*, *44*, 748–755.
- Costello, E. J., Mustillo, S., Erkanli, A., Keeler, G., & Angold, A. (2003). Prevalence and development of psychiatric disorders in childhood and adolescence. *Archives of General Psychiatry*, *60*, 837–844.
- Crijnen, A. A., Achenbach, T. M., & Verhulst, F. C. (1999). Problems reported by parents of children in multiple cultures: The Child Behavior Checklist syndrome constructs. *The American Journal of Psychiatry*, *156*, 569–574.
- Fantuzzo, J., Grim, S., Mordell, M., McDermott, P., Miller, L., & Coolahan, K. (2001). A multivariate analysis of the revised Conners' Teacher Rating Scale with low-income, urban preschool children. *Journal of Abnormal Child Psychology*, *29*, 141–152.
- Faraone, S., Biederman, J., & Monuteaux, M. C. (2002). Further evidence for the diagnostic continuity between child and adolescent ADHD. *Journal of Attention Disorders*, *6*, 5–13.
- Gau, S. F., & Soong, W. T. (1999). Psychiatric comorbidity of adolescents with sleep terrors or sleepwalking: a

- case-control study. *The Australian and New Zealand Journal of Psychiatry*, 33, 734–739.
- Gau, S. S. (2007). Parental and family factors for attention-deficit hyperactivity disorder in Taiwanese children. *The Australian and New Zealand Journal of Psychiatry*, 41, 688–696.
- Gau, S. S., Chen, S. J., Chou, W. J., Cheng, H., Tang, C. S., Chang, H. L., et al. (2008). National survey of adherence, efficacy and side effects of methylphenidate in children with attention-deficit/hyperactivity disorder in Taiwan. *The Journal of Clinical Psychiatry*, 69, 131–140.
- Gau, S. S., Chong, M. Y., Chen, T. H., & Cheng, A. T. (2005). A 3-year panel study of mental disorders among adolescents in Taiwan. *The American Journal of Psychiatry*, 162, 1344–1350.
- Gau, S. S., Huang, Y. S., Soong, W. T., Chou, M. C., Chou, W. J., Shang, C. Y., et al. (2007). A randomized, double-blind, placebo-controlled clinical trial on once-daily atomoxetine in Taiwanese children and adolescents with attention-deficit/hyperactivity disorder. *Journal of Child and Adolescent Psychopharmacology*, 17, 447–460.
- Gau, S. S., Shang, C. Y., Liu, S. K., Lin, C. H., Swanson, J., Liu, Y. C., et al. (2008). Psychometric properties of the Chinese version of the Swanson, Nalon, and Pelham, version IV scale-parent form. *International Journal of Methods in Psychiatric Research*, 17, 36–44.
- Gau, S. S., Shen, H. Y., Soong, W. T., & Gau, C. S. (2006). An open-label, randomized, active-controlled equivalent trial of osmotic release oral system methylphenidate in children with attention-deficit/hyperactivity disorder in Taiwan. *Journal of Child and Adolescent Psychopharmacology*, 16, 441–455.
- Gau, S. S., Soong, W. T., Chiu, Y. N., & Tsai, W. C. (2006). Psychometric properties of the Chinese version of the Conners' Parent and Teacher Rating Scales-Revised: Short Form. *Journal of Attention Disorders*, 9, 648–659.
- Gaub, M., & Carlson, C. L. (1997). Behavioral characteristics of DSM-IV ADHD subtypes in a school-based population. *Journal of Abnormal Child Psychology*, 25, 103–111.
- Goodman, R. (1999). The extended version of the Strengths and Difficulties Questionnaire as a guide to child psychiatric caseness and consequent burden. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, 40, 791–801.
- Hoza, B., Owens, J. S., Pelham, W. E., Swanson, J. M., Conners, C. K., Hinshaw, S. P., et al. (2000). Parent cognitions as predictors of child treatment response in attention-deficit/hyperactivity disorder. *Journal of Abnormal Child Psychology*, 28, 569–583.
- Jensen, P. S., Rubio-Stipec, M., Canino, G., Bird, H. R., Dulcan, M. K., Schwab-Stone, M. E., et al. (1999). Parent and child contributions to diagnosis of mental disorder: Are both informants always necessary? *Journal of the American Academy of Child and Adolescent Psychiatry*, 38, 1569–1579.
- Johnston, C., & Jassy, J. S. (2007). Attention-deficit/hyperactivity disorder and oppositional/conduct problems: Links to parent-child interactions. *Journal of the Canadian Academy of Child and Adolescent Psychiatry*, 16, 74–79.
- Keating, G. M., & Figgitt, D. P. (2002). Dexamethylphenidate. *Drugs*, 62, 1899–1904.
- King, C., & Young, R.D. (1982). Attentional deficits with and without hyperactivity: Teacher and peer perceptions. *Journal of Abnormal Child Psychology*, 10, 483–495.
- Kumar, G., & Steer, R. A. (2003). Factorial validity of the Conners' Parent Rating Scale-revised: Short form with psychiatric outpatients. *Journal of Personality Assessment*, 80, 252–259.
- McGough, J., McCracken, J., Swanson, J., Riddle, M., Kollins, S., Greenhill, L., et al. (2006). Pharmacogenetics of methylphenidate response in preschoolers with ADHD. *Journal of the American Academy of Child and Adolescent Psychiatry*, 45, 1314–1322.
- Molina, B. S., Smith, B. H., & Pelham, W. E. (2001). Factor structure and criterion validity of secondary school teacher ratings of ADHD and ODD. *Journal of Abnormal Child Psychology*, 29, 71–82.
- Mugnaini, D., Masi, G., Brovedani, P., Chelazzi, C., Matas, M., Romagnoli, C., et al. (2006). Teacher reports of ADHD symptoms in Italian children at the end of first grade. *European psychiatry*, 21, 419–426.
- Muthen, L. K., & Muthen, B.O. (1998). *Mplus User's Guide* (2nd Ed.). Los Angeles, CA: Muthen & Muthen.
- Newcorn, J. H., Halperin, J. M., Jensen, P. S., Abikoff, H. B., Arnold, L. E., Cantwell, D. P., et al. (2001). Symptom profiles in children with ADHD: Effects of comorbidity and gender. *Journal of the American Academy of Child and Adolescent Psychiatry*, 40, 137–146.
- Nolan, E. E., Gadow, K. D., & Sprafkin, J. (2001). Teacher reports of DSM-IV ADHD, ODD, and CD symptoms in schoolchildren. *Journal of the American Academy of Child and Adolescent Psychiatry*, 40, 241–249.

- Pelham, W. E., Gnagy, E. M., Burrows-Maclean, L., Williams, A., Fabiano, G. A., Morrisey, S. M., et al. (2001). Once-a-day Concerta methylphenidate versus three-times-daily methylphenidate in laboratory and natural settings. *Pediatrics*, *107*, E105.
- Pelham, W. E., Gnagy, E. M., Greenslade, K. E., & Milich, R. (1992). Teacher ratings of DSM-III-R symptoms for the disruptive behavior disorders. *Journal of the American Academy of Child and Adolescent Psychiatry*, *31*, 210–218.
- Polanczyk, G., de Lima, M. S., Horta, B. L., Biederman, J., & Rohde, L. A. (2007). The worldwide prevalence of ADHD: A systematic review and meta-regression analysis. *The American Journal of Psychiatry*, *164*, 942–948.
- Singer, J. D. (1998). Using SAS PROC MIXED to fit multilevel models, hierarchical models, and individual growth models. *Journal of Educational and Behavioral Statistics*, *23*, 323–355.
- Swanson, J. M. (1992). *School-based assessments and interventions for ADD students*. Irvine, CA: KC publishing.
- Swanson, J. M., Kraemer, H. C., Hinshaw, S. P., Arnold, L. E., Conners, C. K., Abikoff, H. B., et al. (2001). Clinical relevance of the primary findings of the MTA: success rates based on severity of ADHD and ODD symptoms at the end of treatment. *Journal of the American Academy of Child and Adolescent Psychiatry*, *40*, 168–179.
- Swanson, J. M., Sandman, C. A., Deutsch, C., & Baren, M. (1983). Methylphenidate hydrochloride given with or before breakfast: I. Behavioral, cognitive, and electrophysiologic effects. *Pediatrics*, *72*, 49–55.
- The MTA Cooperative Group. (1999). A 14-month randomized clinical trial of treatment strategies for Attention-Deficit/Hyperactivity Disorder. *Archives of General Psychiatry*, *56*, 1073–1086.
- Tripp, G., Schaughency, E. A., Clarke, B., Tripp, G., Schaughency, E. A., & Clarke, B. (2006). Parent and teacher rating scales in the evaluation of attention-deficit hyperactivity disorder: contribution to diagnosis and differential diagnosis in clinically referred children. *Journal of Developmental and Behavioral Pediatrics*, *27*, 209–218.
- Waschbusch, D. A., & King, S. (2006). Should sex-specific norms be used to assess attention-deficit/hyperactivity disorder or oppositional defiant disorder? *Journal of Consulting & Clinical Psychology*, *74*, 179–185.
- Wigal, S., Swanson, J. M., Feifel, D., Sangal, R. B., Elia, J., Casat, C. D., et al. (2004). A double-blind, placebo-controlled trial of dexamethylphenidate hydrochloride and d,l-threo-methylphenidate hydrochloride in children with Attention-Deficit/Hyperactivity Disorder. *Journal of the American Academy of Child and Adolescent Psychiatry*, *43*, 1406–1414.
- Wolraich, M. L., Lambert, E. W., Baumgaertel, A., Garcia-Tornel, S., Feurer, I. D., Bickman, L., et al. (2003). Teachers' screening for attention deficit/hyperactivity disorder: comparing multinational samples on teacher ratings of ADHD. *Journal of Abnormal Child Psychology*, *31*, 445–455.
- Zolotor, A., Mayer, J., & Hill, J. (2004). Clinical inquiries. Does a short symptom checklist accurately diagnose ADHD? *The Journal of Family Practice*, *53*, 412–416.